Reprinted from THE CLINICAL JOURNAL OF PAIN
Vol. 23 No. 2 February 2007

ORIGINAL ARTICLE

Urine Toxicology Screening Among Chronic Pain Patients on Opioid Therapy: Frequency and Predictability of Abnormal Findings

Edward Michna, MD, JD, Robert N. Jamison, PhD,*† Loc-Duyen Pham, BS,* Edgar L. Ross, MD,* David Janfaza, MD,* Srdjan S. Nedeljkovic, MD,* Sanjeet Narang, MD,* Diane Palombi, RN,* and Ajay D. Wasan, MD, MSc*†*

Objective: To examine the incidence of abnormal urine toxicology screening among chronic pain patients prescribed opioids for their pain and to relate these results to patient descriptors and type, number, and dose of prescribed opioids.

Methods: A retrospective analysis of data from 470 patients who had urine screening at a pain management program in an urban teaching hospital was performed. Urine samples were analyzed using gas chromatography-mass spectrometry. Patients were categorized as having urine screens that were "normal" (expected findings based on their prescribed drugs) or abnormal. Abnormal findings were those of (1) absence of a prescribed opioid, (2) presence of an additional nonprescribed controlled substance, (3) detection of an illicit substance, and (4) an adulterated urine sample.

Results: Forty-five percent of the patients were found to have abnormal urine screens. Twenty percent were categorized as having an illicit substance in their urine. Illicit substances and additional drugs were found more frequently in younger patients than in older patients ($P < 0.001$). No other variables were found to predict abnormal urine screen results.

Discussion: These results confirm past findings that random urine toxicology screens among patients prescribed opioids for pain reveal a high incidence of abnormal findings. Common patient descriptors, and number, type, and dose of prescribed opioids were found to be poor predictors of abnormal results.

Key Words: urine testing, opioids, adherence, misuse, urine toxicology screens, chronic pain, opioid therapy, substance abuse

(*Clin J Pain* 2007;23:173–179)

Chronic pain is a problem of immense proportions.[1] Chronic pain symptoms afflict 1 in 5 adult Americans and accounts for 21% of emergency room visits and 25% of annual missed work days.[2,3] Several studies have confirmed the usefulness of opioids in the treatment of chronic pain.[4,5] Unfortunately, the abuse of prescription opioids presents a challenge for prescribing physicians.[6,7] Over the past 10 years, the use and abuse of prescription opioids has increased markedly. In 2002, for example, prescription opioid analgesics accounted for 9.9% of all drug abuse, up from 5.8% in 1997.[8]

Past research has shown that some patients exhibit aberrant drug-related behaviors after taking medically prescribed drugs for organic pathologic conditions, such as use of additional, nonprescribed opioids, or illegal drugs.[9] Some individuals prescribed opioids for pain develop problems because of biologic and environmental susceptibility factors, such as a family history of addiction, temperament, poor support, and drug availability. These individuals often report that they develop a craving and high tolerance for the opioids and take more medication than prescribed.[10] Aberrant drug-related behavior sometimes associated with addiction is perpetuated by a physiologic drive that comes with using or withdrawing from opioids.[11] In a review of the relevant literature, Fishbain et al[12] found that the prevalence of addiction to any substance in a pain population ranges from 3.2% to 18.9%. Although not definitively studied, clinicians may assume that patients who are on higher doses of opioids and request specific medications, which may have a high abuse potential may be at greater risk for opioid misuse.[11]

Pain medicine practitioners are increasingly using urine drug tests (UDT) to monitor adherence to chronic opioid therapy.[13] Although a urine screen by itself cannot determine the presence of addiction, a highly sensitive and specific urine screen [such as using gas chromatography-mass spectrometry (GCMS)] can determine if the patient is taking the prescribed medications, taking illegal drugs, or taking nonprescribed medications, that is, adherence to the opioid treatment plan versus aberrant drug behavior.[13] Chronic pain patients have been found to be unreliable in their report of misuse of prescription medications and use of other illicit substances[14,15] Berndt

Received for publication June 12, 2006; accepted October 8, 2006.
From the *Department of Anesthesiology, Perioperative and Pain Medicine; and †Department of Psychiatry, Brigham and Women's Hospital, Harvard Medical School, Boston, MA.
Reprints: Ajay D. Wasan, MD, MSc, Pain Management Center, 850 Boylston St, Suite 320, Chestnut Hill, MA 02467 (e-mail: awasan@partners.org).

and others[15] interviewed 109 patients with chronic pain about their present medication and compared this information with the results of urine toxicology screening using GCMS technology. In 32% of these patients, the results of the urine screening did not correspond with the patient's report of prescription medication use. In another study among 111 patients treated in a cancer center who were receiving opioids for pain, random urine toxicology screens showed that 51% had evidence of the use of either one or more illicit substances or a prescription medication that had not been prescribed.[16] This study did not mention which urine screen technology was used (GCMS or immunoassay).

UDTs have been valuable in determining whether a patient prescribed opioids for pain might be misusing their medication.[14,17] In a study of 122 patients maintained on chronic opioid therapy, urine toxicology results and aberrant drug-related behaviors identified 43% of patients as having a "problem" (using immunoassays).[14] Of patients with no behavioral issues, 21% had a positive urine screen for either an illicit drug or a nonprescribed controlled medication. In another study of 226 chronic pain patients, 46.5% of urine toxicology screen results were abnormal (using GCMS).[18]

The aim of this study was to determine the incidence of abnormal results of urine drug screens among a large sample of noncancer patients with chronic pain receiving prescription opioid medication in a pain management center. Abnormal results included missing the prescribed opioid, or the presence of illegal drugs or nonprescribed opioids. We were interested in identifying the type of patients who demonstrated abnormal urine screen tests and to correlate these results on the basis of demographic and opioid use characteristics. In particular, we hypothesized that those patients who were prescribed larger quantities of both long-acting and short-acting opioids, and those who were prescribed opioids with a perceived higher abuse potential (such as long-acting oxycodone) would demonstrate an increased incidence of abnormal urine screens. We also predicted that younger, male patients with multiple pain sites would demonstrate a higher frequency of abnormal urine toxicology results.

MATERIALS AND METHODS

This is a retrospective cohort study of urine toxicology results of chronic pain patients prescribed opioids. Approval for a retrospective analysis of the data was obtained from the Institutional Review Board of our institution. As part of routine clinical care, all patients who were prescribed opioids at a pain management center of an urban teaching hospital were requested to submit a urine sample for drug testing before receiving their next opioid prescription. Patients were not told before their appointment that a urine screening would be requested.

The urine collection procedure entailed recording a patient's current medications along with the date and time the last medications had been taken. Each patient was given a specimen cup and instructed to provide a urine sample (~30 to 75 mL of urine) without supervision in the clinic bathroom. A member of the clinic staff sealed the specimen and determined the approximate temperature of the urine shown on a liquid crystal thermometer on the side of the cup. All urine screen data reported in this study were collected within a 6-week period (5/25/05 to 7/5/05). The UDT was performed by SECON (www.seconne.com) using GCMS technology, which is highly accurate[19] and considered to be the "gold standard" for urine drug testing for prescription opioids.[13] The technique involves direct visualization of the compound under electron ionization spectrometry and the error rate is primarily based on human visualization or data transcription errors. SECON uses a detection limit of 50 ng/mL, and the laboratory's error rate is 4/10,000 samples. The UDT reported evidence for the presence of 6-monacetylmorphine (6-MAM, a unique heroin metabolite), codeine, dihydrocodeine, morphine, oxycodone, oxymorphone, hydrocodone, hydromorphone, meperidine, methadone, propoxyphene, buprenophine, fentanyl, tramadol, amphetamines, barbiturates, benzodiazepines (including clonazepam), cannabinoids, cocaine, and alcohol. The urine analyses included measures of sample quality, reporting specific gravity, pH, and creatinine concentration in the urine, to enable identification of adulterated samples. The urine toxicology results were posted on a secure website and independently sent to the pain center.

After deidentifying sensitive patient information, results of the toxicology screen and information from the patient medical records were entered into a data file. Additional information was obtained from the electronic medical records, including dates, number, quantities, and doses of each medication prescribed (including intrathecal prescriptions). Because the focus of this study was on understanding the relationship between demographic factors, opioid use characteristics, and UDT results, we described the pain condition by location, recognizing that there is significant heterogeneity within these categories. In keeping with our focus, we did not examine how the decision was made to prescribe opioids or whether the patient was benefiting from them.

To establish severity categories so that the urine results could be operationally defined and grouped together for purposes of analysis, clinic staff—including attending physicians, fellows, nurses, and support staff—were asked to rank order possible outcomes of urine screen results from most severe to least severe. This was performed to generate a methodology for classifying the results and not to assert that one type of test abnormality is definitively better or worse than another. These abnormal categories were: (1) evidence of an illicit substance (such as marijuana or cocaine), (2) evidence of an additional nonprescribed opioid, (3) lack of evidence of a prescribed opioid in the urine, (4) both evidence of an additional nonprescribed opioid and a lack of evidence of a prescribed opioid, and (5) an adulterated sample.

The results of the urine screens were independently assessed by 2 clinicians who assigned each sample to one

of these categories after reaching consensus on the results (E.M. and A.D.W.). A sample was only classified as missing a prescribed opioid if the substance should be in the urine at the time the patient gave the sample. For instance, some patients prescribed prn opioids may report taking them infrequently and taking their last dose more than 6 hours before giving a urine sample. In these cases, it may be appropriate for the opioid not to be in the urine. On the other hand, those patients who reported running out early in relation to their prescription dates and had the substance absent in their urine were categorized as lacking the prescribed opioid(s). Samples that met criteria for multiple classifications, such as presence of an illicit substance and of additional nonprescribed opioids, were categorized in the most severe category on the basis of clinic staff consensus. For the analysis, we assumed that adulterated samples were indicative of patients trying to avoid detection of an illicit substance, and thus were placed in that category. For those patients with evidence in their urine of a barbituate, benzodiazepine, or amphetamine not prescribed by a pain clinic physician, we sought to verify whether another physician (such as a primary care physician) had prescribed this drug (using electronic medical record information). We then classified this result in the appropriate category (normal or one of the abnormality categories). If this information could not be verified, that is, we could not clearly say that it was abnormal; we classified the presence of these substances as "normal." We took into account the normal metabolic conversions of opioids in classifying the samples, such as codeine metabolized to morphine or hydrocodone metabolized to hydromorphone. Because hydromorphone may also be a metabolite of morphine,[20] its presence was not considered an abnormality in those patients taking morphine. We did note any discrepancies in what was prescribed and what was found in the urine.

All data were analyzed with SPSS software (version 11.0, Chicago, IL). Descriptive methods were used to calculate the frequency of abnormalities. Parametric and nonparametric analyses were used to examine differences in demographic information, urine toxicology results, rates of abnormalities, and type of opioid prescribed and detected. Patient results were grouped by the categories of urine-screening results. Logistic regression was used to determine whether the frequency of an abnormal screening result was related to the amount of morphine equivalents prescribed per day. In other words, for those taking greater doses of opioid compared to those taking lesser amounts, is there a difference in the rate of urine abnormalities? Morphine equivalents were calculated from a published conversion table.[10]

RESULTS

Patient information from 470 patients with urine toxicology results are presented in Table 1, including age, sex, pain site distribution, and opioid use. Thirty-eight patients (8%) were prescribed morphine equivalent doses > 700 mg/d, which skewed the mean. Although, a comparison of patients from the same pain management center on opioid therapy for chronic pain from previous studies suggests closely matched similarities to the present sample.[10,21] A review of the medical records suggests that none of the patients refused to give a urine sample, although 3 patients reportedly had trouble urinating and returned at another time to submit a urine sample. The most frequently prescribed opioid was oxycodone (sustained or immediate release) followed by methadone. The types and percentages of prescribed and detected opioids for all patients and the percentage of each prescribed drug detected in the urine are presented in Table 2. Among all the patients, the largest discrepancies between the percentage of patients prescribed a drug and the percentage of patients in whom it was detected in the urine was for hydromorphone (14.2% difference) and oxycodone (13.3%), with more hydromorphone detected than prescribed and less oxycodone detected than prescribed for the total sample. Among patients who were prescribed a particular drug, hydrocodone was shown to have the lowest incidence of detection in the urine (25.7%), even though this drug was prescribed for only 35 patients. Note that these percentages include the normal metabolic conversions and include some patients who may appropriately not have the opioid(s) in their urine.

A breakdown of percentages of other substances detected in the urine is presented in Table 3. Twenty-two percent showed evidence of an illegal drug, most of which

TABLE 1. Demographic and Medication Information (N = 470)

Variable	
Age (means)	47.0 ± 10.4 (range 21-85)
Sex (% male)	54.0
Low back pain (% yes)	42.7
Multiple pain sites (% yes)	12.8
Opioids (%)	
Short-acting only	29.1
Long-acting only	28.1
Both long-/short-acting	42.8
Average morphine equivalent (mg/d)	275.0 ± 310.0 (5-2880)
No. opioids (mean)	1.4 ± 0.55 (1-3)

TABLE 2. Type of Prescribed and Detected Opioids (N = 470)

Drug	% Prescribed of All Patients	% Detected of All Patients	% Detected in Those Prescribed
Oxycodone	59.5	46.2	66.2
Methadone	21.9	21.6	87.9
Morphine	19.6	24.6	81.8
Fentanyl	16.1	15.9	75.0
Hydromorphone	11.1	25.3	77.8
Hydrocodone	7.7	7.6	25.7
Propoxyphene	2.1	2.0	45.5
Codeine	0.2	5.1	100.0

No drugs detected in 33 patients (7.0%).
Tramadol detected in 7 patients (1.5%).

TABLE 3. Other types of Drug Detected From Urine Toxicology Screens (N = 470)

Drug Type	% Detected
Benzodiazepines	22.0
Marijuana	14.6
Cocaine	6.8
Barbiturates	4.8
Amphetamines	2.6
Heroin	2.0
Alcohol	1.1
PCP	< 0.1

was cannabis (14.6% of all screens). Seven percent showed evidence of cocaine and 2.0% heroin. Prescription opioid(s) was absent in 12% of the samples; the majority of these patients (8.7%) reported that they had run out of their medication early. Although urine temperature was within the normal range, 11 patients were identified as having abnormal creatinine concentrations, and 1 patient had an abnormal pH balance, suggestive of sample tampering. Overall, 44.8% of the urine toxicology screens were considered abnormal.

Staff members within the pain center (6 attending pain physicians, 5 pain fellows, 5 pain nurses, and 5 pain clinic support staff) were asked to rank order the severity of urine screen results that may indicate a possible substance abuse disorder. Illicit substances found in the urine and adulterated urine samples were perceived to be most indicative of a substance abuse disorder and had the highest severity rankings. Because few patients had evidence of adulterated urine (N = 12), these patients were grouped together with those patients with evidence of an illicit substance. Noted differences were found among some staff members as to the perceived severity of the presence of marijuana in the urine as compared with that of cocaine and heroin.

Evidence of an additional nonprescribed drug in the urine was ranked second in severity. Ranked third was lack of evidence of a prescribed drug in the urine and a normal result was ranked least severe and least indicative of evidence of a substance abuse disorder. Patients were grouped on the basis of these categories. Those patients whose toxicology results might place them in 2 or more categories were placed in the most severe category (eg, someone missing a prescription drug and with evidence of cocaine in the urine was placed in the illicit substance category). Twelve patients with adulterated samples were placed in the illicit substance category and 11 patients who had evidence of both an additional opioid and missing drug were placed in the additional drug category. These results are presented in Table 4.

Twenty percent of the patients were found to have an illicit substance detected in their urine. Fourteen percent had evidence of an additional drug and 10.2% showed results of a missing drug. Younger patients were found to have significantly more abnormal urine results than older patients ($P < 0.001$); mean age differences between groups ranged between 44 and 48 years. No other significant relationships could be found between the urine toxicology groups based on sex, pain site, number of prescription opioids, morphine equivalence dose, the type of opioid prescribed (long-acting, short-acting, or both), or the specific brand-name compound. To address whether certain physicians had more patients with aberrant drug results than others, analyses were conducted to assess the relationship between the prescribing physician and the rate of urine toxicology abnormalities. Of the 8 prescribing physicians, the number of patients prescribed opioids for pain ranged between 5 and 195 (mean = 58.8). This range relates to the size of the physicians' practices, their preference for prescribing opioids, and whether they are primarily in a consultant or prescriber role. No differences were found in the incidence of abnormal urine screen results among the 8 physicians. In summary, other than age, none of the variables captured in this study were perceived to be useful as predictors of abnormal urine toxicology screens.

DISCUSSION

This retrospective study of urine screen data from an urban pain management center found that 4 of 10

TABLE 4. Urine Screen Results by Age, Sex, Type of Opioid, Number of Types of Opioids, Percent With Low Back Pain, and Morphine Equivalent (N = 470)

	Urine Results				
Variable	Normal (55%, N = 259)	Missing Opioid (10.2%, N = 48)	Additional Drug† (14.5%, N = 68)	Illicit Substance‡ (20.2%, N = 95)	P
Age (mean y)	48.4 (± 10.7)	48.9 (± 10.0)	44.4 (± 10.0)	44.1 (± 9.3)	F = 5.7*
Sex (% male)	56.4	50.0	57.4	47.4	NS
Long-acting short-acting opioid (% yes)	43.2	50.0	30.9	46.3	NS
Pain site (% low back pain)	42.2	45.9	43.3	42.1	NS
Total no. opioids	1.4 (± 0.6)	1.6 (± 0.7)	1.3 (± 0.5)	1.4 (± 0.5)	NS
Morphine equivalent dose (mg)	280.8 (± 291.1)	249.1 (± 236.2)	241.1 (± 258.7)	296.5 (± 411.8)	NS

*$P < 0.001$.
†Eleven patients had both evidence of an additional drug and the absence of a prescribed opioid in their urine.
‡Twelve patients had adulterated samples and were assumed to be avoiding detection of an illicit substance.
NS indicates nonsignificant.

patients prescribed opioids for pain had abnormal results. The majority of these abnormalities (20.2%) consisted of the presence of illegal drugs in the urine samples, followed by the presence of additional prescription drugs (14.4%) or the absence of prescribed medication (10.2%). A small percentage of the patients showed an evidence of tampering with their urine (2.3%). Fifty-five percent of the patients had normal results.

Contrary to the hypotheses, no relationship between sex, pain site, type of opioid, opioid dose, number of opioids prescribed, prescribing physician, and type of abnormal toxicology result was found. Only younger patients were found to have used illicit substances and/or an additional prescription opioid that had not been documented in the medical record more often than were older patients. Although differences between 48 and 44 years of age were found to be statistically significant, one could argue that these do not represent clinical significance. Thus, we could not identify any clear predictive factors for aberrant drug behavior based on these variables. Considering the attention by the pain medicine community and the media to the misuse and abuse potential of specific opioid compounds (eg, controlled-release oxycodone), we were surprised to find, contrary to expectations, that the type or amount of prescribed drug were not predictors of abnormalities in urine toxicology screens.

In light of the explosion in the prescribing of opioids for noncancer pain[22] and the high incidence of abnormal urine toxicology findings, our results highlight the need for frequent monitoring for adherence. Given that self-report of substance-use history by chronic pain patients is unreliable,[14] frequent urine screens using GCMS, in conjunction with careful observation of patient behavior, can provide important information on therapy compliance.

Physicians often must determine the appropriateness of prescribing long-term opioids with very little information other than that provided by the patient. This frequently can occur on the first visit to a specialist or a primary care physician, when there has been no prior contact with the patient or past records. As a result, physicians may rely on demographic information; previously published assumed "risk factors"; medication requests and/or doses; and "gut" instinct of whether a patient will misuse prescription opioids intended for pain relief. Ideally, it is important to have relevant records and speak directly with prior treating physicians. In particular, it is important that specialist physicians speak with the patient's primary care physician. In some situations, even after this communication takes place, there may not be adequate information to make an informed judgment. Past literature suggests that those who are preoccupied with opioids, request certain drugs, and require a high dose of medication for adequate pain relief are prone to medication misuse.[11,23] The results of this study suggest that judgmental biases and reliance on "red flags" such as these to predict opioid misuse may prove to be incorrect.

Our findings speak to the importance of collecting urine samples regularly from patients prescribed opioids for pain. Urine screens may also be a useful method for monitoring the success of opioid therapy agreements (opioid contracts). These findings underscore the importance of determining the risk of opioid misuse before prescribing opioid medication for pain. Past studies have found that a prior substance abuse history, a positive family history of substance abuse, or a history of illegal activities were predictive of aberrant drug-related behavior.[10] Recent studies have focused on the development of validated scales to identify those individuals who would be categorized as a high or low risk for opioid misuse.[24–26]

If it has been determined that a patient misused their opioids, current literature, unfortunately, provides few treatment guidelines which are based on empirical evidence. This is a largely unexplored research area in opioid treatment, but a few general management principles do apply. The Federation of State Medical Boards advises that physicians periodically monitor opioid treatment compliance in the areas of pain relief, function, quality of life, and opioid misuse.[27] These guidelines advise the treating provider to reconsider opioid therapy in cases of aberrant drug behavior, to be certain that opioids are serving a legitimate medical purpose. In the case of a patient using illegal drugs, only under special circumstances (eg, a patient near the end of life) should opioids be prescribed concurrently. If the prescribing physician determines that the patient is addicted to prescription opioids, they are obligated to help the patient obtain substance abuse treatment and are advised to discontinue opioid therapy (with taper) or transfer the treatment to an addiction specialist.

Although consistent with previous studies and the 40% opioid misuse rate in our clinic is of great concern. In response, we have changed our clinic practice to include: (1) more stringent evaluation for opioid abuse potential before making the decision to prescribe. This entails the use of a validated scale, a urine toxicology screen at baseline, and possibly a psychologic evaluation to better understand any psychosocial risk factors for opioid misuse, (2) at least yearly urine toxicology screens, and (3) follow-up visits to monitor opioid compliance at least every 4 months.

The primary aberrant drug behaviors identified in this study were: (1) inappropriate absence of the prescribed opioid in the urine, (2) taking additional, nonprescribed opioids, (3) taking illegal drugs, and (4) urine sample tampering. Each of the 8 prescribing physicians has their own treatment style for addressing these behaviors. In general, patients are seldom "fired," but opioids may be discontinued and the patient may be referred for substance abuse treatment if needed. To summarize, our approach to the absence of opioid is first to determine whether the patient ran out early or if they are possibly diverting it. If diversion is suspected, the opioid is immediately stopped. For running out early, the provider determines if this is *pseudoaddiction*, a misuse

behavior, or perhaps an addiction disorder (with the aid of a psychologic or psychiatric consult if necessary). For nonprescribed opioids in the urine, a similar approach is taken. For illegal drugs in the urine, the opioid is stopped and the patient is referred for substance abuse treatment. Although for cannabis, there is great variability among the clinic attendings in addressing this issue. Since the number of patients tampering with their urine samples appears to be quite low, as yet there is no consensus among the staff about how to handle this issue.

Several limitations of our study deserve mention, relating to the study method, the limits of urine screens to prove opioid misuse, the value of additional patient information about the propensity for opioid misuse, and the impact of renal and liver function on urine test results. First, this is a retrospective descriptive study of the relationship between a single urine toxicology screen and patient data for identifying the misuse of opioid medications. This methodology does have drawbacks. While we believe that we collected urine screen data from almost all of the patients prescribed opioids for pain in our clinic, selection biases may exist. Also, we did not follow patients over time by obtaining repeated toxicology screens. Thus, because these data represent results of one urine screen, we might not have detected some patients who were misusing their medications. Furthermore, because this was not a controlled trial, the results are correlational and not empirically based. Second, urine toxicology analyses cannot always prove opioid misuse and the results are subject to false positives or false negatives. For instance, for most of those patients who did not have the prescription opioid(s) in their urine, we cannot determine definitively whether this was due to their running out of the medication or to their diverting it. Additional information to help establish an addiction disorder, such as frequent reports of lost or stolen prescriptions and reports of craving the medication, would have also been valuable. Third, additional descriptive characteristics of the patients were not captured. We know that pain intensity, function, mood, and history of aberrant drug behavior can be helpful predictors of prescription opioid misuse. Incorporating a screening tool of opioid abuse potential would have offered additional useful information.[24] Future studies would benefit from more detailed information from the chronic pain patients including formal risk assessment. Finally, no investigation was done of renal or metabolic function of these patients, which could offer additional useful information.

Despite these limitations, the use of a sensitive urine toxicology screen for all patients prescribed opioids in a large pain medicine practice proves to be important because it may help identify a high incidence of medication misuse and aberrant drug behavior. Urine toxicology screens can be useful in monitoring opioid therapy adherence, especially since there may not be a correlation between patient demographic, medical, and behavioral variables in predicting whether opioid misuse is occurring. Our findings highlight the value of using GCMS urine toxicology screens in this regard. Our study also suggests that a physician's judgmental biases and "gut instinct" poorly predict the incidence of abnormal urine toxicology tests. Because the results of a one-time screening cannot determine the effect of urine toxicology screening on adherence, further assessment of the impact of serial urine screens on adherence to opioid therapy is needed. The results of our study highlight the need for further research in this area. These results also support the need for regular monitoring guidelines to help refine opioid treatment for noncancer pain. Our findings support the importance of identifying those at risk for prescription drug misuse, and of closely monitoring all patients with regular urine screens to lower the rate of nonadherence to opioid therapy and to reduce the rate of inappropriate opioid prescribing.

ACKNOWLEDGMENTS

The authors thank Joyce Bradley, Nancy Carlson, Mary Carney, Julie Tierney, and Sarah O'Shea for their support for this study, and to Nancy Voynow for reviewing an earlier version of this paper. They are also greatly indebted to Jon Podorni from SECON for all of his help with the urine toxicology screens.

REFERENCES

1. Ehrlich GE. Back pain. *J Rheumatol Suppl*. 2003;67:26–31.
2. Joranson DE, GIbson AM. Policy issues and imperatives in the use of opioids to treat pain in substance abusers. *J Law Med Ethics*. 1994;22:215–223.
3. Ferrari R, Russell AS. Regional musculoskeletal conditions: neck pain. *Best Pract Res Clin Rheumatol*. 2003;17:57–70.
4. Jamison RN, Raymond SA, Slawsby EA, et al. Opioid therapy for chronic noncancer back pain. *Spine*. 1998;23:2591–2600.
5. AAPM. American Academy of Pain Medicine and American Pain Society consensus statement: the use of opioids for the treatment of chronic pain. *Pain Forum*. 1997;77–79.
6. Manchikanti L, Fellows B, Damron KS, et al. Prevalence of illicit drug use among individuals with chronic pain in the commonwealth of Kentucky: an evaluation of patterns and trends. *J KY Med Assoc*. 2005;103:55–62.
7. Joranson DE, Ryan KM, Gilson AM, et al. Trends in medical use and abuse of opioid analgesics. *JAMA*. 2000;283:1710–1714.
8. Gilson AM, Ryan KM, Joranson DE, et al. A reassessment of trends in the medical use and abuse of opioid analgesics and implications for diversion control: 1997-2002. *J Pain Symptom Manage*. 2004;28:176–188.
9. Jamison RN, Kauffman J, Katz NP. Characteristics of methadone maintenance patients with chronic pain. *J Pain Symptom Manage*. 2000;19:53–62.
10. Michna E, Ross EL, Hynes WL, et al. Predicting aberrant drug behavior in patients treated for chronic pain: importance of abuse history. *J Pain Symptom Manage*. 2004;28:250–258.
11. Nedeljkovic SS, Wasan AD, Jamison RN. Assessment of efficacy of long-term opioid therapy in pain patients with substance abuse potential. *Clin J Pain*. 2002;18:S39–S51.
12. Fishbain DA, Rosomoff HL, Rosomoff RS. Drug abuse, dependence, and addiction in chronic pain patients. *Clin J Pain*. 1992; 8:77–85.
13. Heit HA, Gourlay DL. Urine drug testing in pain medicine. *J Pain Symptom Manage*. 2004;27:260–267.
14. Katz NP, Sherburne S, Beach M, et al. Behavioral monitoring and urine toxicology testing in patients receiving long-term opioid therapy. *Anesth Analg*. 2003;97:1097–1102.

15. Berndt S, Maier C, Schutz HW. Polymedication and medication Compliance in patients with chronic non-malignant pain. *Pain*. 1993;52:331–339.
16. Passik SD, Schreiber J, Kirsh KL, et al. A chart review of the ordering and documentation of urine toxicology screens in a cancer center: do they influences patient management? *J Pain Symptom Manage*. 2000;19:40–44.
17. Preston KL, Silverman K, Schulter CR, et al. Comparison of self-reported drug use with quantitative and qualitative urinalysis for assessment of drug use in treatment studies. *NIDA RE Monog*. 1997;167:130–145.
18. Fishbain DA, Cutler RB, Rosomoff HL, et al. Validity of self-reported drug use in chronic pain patients. *Clin J Pain*. 1999;15: 184–191.
19. Caldwell R, Challenger H. A capillary column gas-chromatographic method for the identification of drugs of abuse in urine samples. *Ann Clin Biochem*. 1989;26:430–443.
20. Cone EJ, Heit HA, Caplan YH, et al. Evidence of morphine metabolism to hydromorphone in pain patients chronically treated with morphine. *J Anal Toxicol*. 2006;30:1–5.
21. Jamison RN, Schein JR, Vallow R, et al. Neuropsychological effects of long-term opioid use in chronic pain patients. *J Pain Sympt Manage*. 2003;26:913–921.
22. Ballantyne J, Mao J. Opioid Therapy for Chronic Pain. *NEJM*. 2003;349:1943–1953.
23. Savage S. Addiction and pain: assessment and treatment issues. *Clin J Pain*. 2002;18(4 suppl):S28–S38.
24. Butler SF, Budman SH, Fernandez K, et al. Validation of a screener and opioid assessment measure for patients with chronic pain. *Pain*. 2004;112:65–75.
25. Passik SD, Kirsh KL, Whitcomb L, et al. A new tool to assess and document pain outcomes in chronic pain patients receiving opioid therapy. *(PADT) Clin Ther*. 2004;26:552–561.
26. Adams LL, Gatchel RJ, Robinson RC, et al. Development of a self-report screening instrument for assessing potential opioid medication misuse in chronic pain patients. *J Pain Symptom Manage*. 2004:440–459.
27. Model Policy for the Use of Controlled Substances for the Treatment of Pain, in *Federation of State Medical Boards*. Washington, DC; 2004:1–5.